LEARN HOW SEA LEVEL CHANGE OCCURS Climate Change fifth-grade curriculum-based activity

ACTIVITY 3 What happens in Antarctica / Greenland doesn't stay in Antarctica / Greenland.

Using props, ice, dioramas, maps and art, students will see how sea level rise is caused by melting ice-sheets (not by melting ice-bergs). Melting ice-sheets in Greenland and Antarctica are already causing sea level changes in the Everglades and Miami.

Florida State Standards
SC.5.L.14.2 SC.5.L.15.1 SS.5.C.2.4 SS.5.C.2.5 LA.5.5.2.2

OBJECTIVES Students will be able to

1) Show what happens to sea level when ice-sheets on land melt (Sea level rises).
2) Demonstrate what happens to sea level when icebergs melt (nothing happens to sea level)
3) Connect sea level changes in Miami to ice-sheets melting far away.
4) Explain that FL has had sea level changes caused by melting and freezing of ice-sheets in Antarctica and Greenland.
5) Show that human communities in Florida is / will be affected by sea level rise.
6) Realize that South Florida has been underwater many times in the geologic past.
7) Talk about ways people and communities can mitigate / prepare for / adapt to sea-level rise.

MATERIALS

1) Two shallow, large containers of the same size to be used concurrently to show effects of (i) melting of ice-bergs and (ii) melting of ice-sheets.
2) Lots of Playdoah, fish gravel or some kind of material that can be re-used by students to build their own "Florida" inside the shallow containers.
3) Three upside down plastic bowls of the same size (e.g. fast-food salad bowls). Have a hole pre-punched into each salad bowl.
4) Materials like plastic buildings, animals, trees, etc-that can be put on top of the upside down salad bowls.
5) Exact same amounts of water to be poured into the two shallow containers. (1 gallon milk jugs).
6) Exact same amounts of ice to be used in two experiments (about ½ gallon ice –use two fast-food salad bowls to freeze the water).
7) Waterproof tape to secure an upside down salad bowl onto each of the shallow containers.
8) Rulers to measure sea-level rise in both the containers.
9) Map / globe of the world.
10) Pictures to show ancient geography of FL with different sea levels.

PROCEEDURES – aim to show sea levels change in Florida due to melting ice sheets far away.

- Have students find the Arctic ice caps (not a land mass), Greenland and Antarctica (both are big landmasses covered in ice) and Florida on the globe. Explain the differences between Arctic icebergs, and Antarctica /Greenland ice-sheets. Explain that Antarctica is a continent covered with ice-sheets, and the Arctic ice caps are ice floating in the ocean. In places, Antarctica is covered by tens of thousands of feet of ice. Let them compare the size of Antarctica with the USA. Talk about icebergs being in the water, and ice sheets being on land. Use stats to show the amounts of ice in both locations. Also talk about how South Florida's water level has fluctuated throughout history.
- Divide the students into two groups. Group#1 = effects on Florida of ice bergs melting. Group #2 =effects on Florida of ice sheets melting. Give each group a clear plastic container, two upside-down salad bowl, plastic toys, playdoah, gravel.
- Tell each group that they are going to find out how environments are connected to each other through climate change.
- Attached one upside down salad bowl to the bottom of container #1 – this one bowl is Florida.
- Attached two upside down salad bowls to the bottom of container #2 – one bowl is Florida, the other bowl is Antarctica. Having a hole pre-punched into the salad bowls allows them to sit in the water better.
- Have the students on group #2 pick one of their two upside bowls to represent Florida.
- Pour equal amounts of water into container #1 and #2 – this represents the world's ocean. Pour the water so that it stops about ½ inch from the top of the upside salad-bowls.
- Add the ice for container #1 to container #1 only. The water level will rise a bit – try to have the water no more than ¼ inch from top of the bowl. All this will depend on the amount of ice you're using and the size of the large shallow container.
- Have students on both groups mark this water level / sea level with a dry erase marker on the side of their "Florida" upside-down salad bowl.
- Using the materials provided, have each groups create their own Florida landscapes on-top of their upside-down salad bowl. (Houses, animals, cities, farms, roads, etc). Make a city is on the edge (coastline) of their bowl.
- For group #2 only-place their block of ice on top of their second upside-down bowl. This represents all the ice sheets on top of landmasses like Antarctica and Greenland.
- Wait for the ice bergs and ice sheets to melt. (Go do another activity and come back) or place a heat lamp acting as the sun over the Ice Bergs in#1and Ice Sheets in #2 until the ice has melted.
- **Look at the water level marks in both containers**. Is the water level higher, lower, or the same?
  –"Sea level" will not have changed in group #1. This is because ice-cubes already displaced the ocean water and as the icebergs melted, no more water was added to the oceans.
  -"Sea level" will be higher in group #2. This is because the melting ice-sheets on land added extra water to the oceans. Note what happened to their cities as the water rose in group #2?
- Have students in the Ice Sheet in #2 group mark and measure the new water line, so they can determine how much the water had risen.

- Explain that climate change will affect the northern and southern hemisphere. **Ice-bergs melting WON'T raise sea level, but melting ice-sheets on land WILL raise sea level**.
- Compare and contrast the effect of melting ice bergs and melting ice sheets. (Note: if the teacher while setting up the activity saw the ice cubes in group #1 displace the initial water level by one inch – then the ice sheets melting should have flooded Florida in group #2 by one inch too). Probably the students' harbors, beaches, resorts, Miami, etc. is now underwater. Water already in the ocean no matter what form (solid, liquid, or gas) has the same amount of volume. However, melting ice on land will add more water to the ocean.
- Re-iterate that climate change will not flood Florida over night, but historically there has been a pattern of flooding in South Florida. We already are having higher flooding tides in South Beach.

ASK THE FOLLOWING KINDS OF QUESTIONS

Does what happens in Antarctica doesn't stay in Antarctica? Why?

Why did this happen? Why didn't the ice-bergs melting cause a higher sea level?

What other places is ice melting on land (glaciers)?

What happens to you if you lived / hunted on the arctic now that it's melting? (You loose your habitat – polar bears / Inuit cultures).

What's more of a problem: melting Arctic ice-bergs, or melting ice-sheets on Antarctica / Greenland?

Can you find other places in the map where rising sea level will flood the coastline (Bangladesh, Venice, the Maldives, Tuvalu, Kiribati, other Pacific Islands)

Will this happen overnight, or over your life time?

What can you do to plan / mitigate / adapt for this?

What's causing ice-sheets to melt?

If sea level has risen in Florida before –what is different about it this time? (Millions of people live here now. Billions of dollars of property and investments are based on that assumption that sea level is always the same).

http://www.epa.gov/climatechange/kids/impacts/effects/coastal.html

http://www.nature.nps.gov/climatechange/docs/SFCN_CC.pdf

http://www.nasa.gov/topics/earth/features/greenland-melt.html